
GDP DILEMMA ANALYZED IN TERMS OF CORRELATION BETWEEN LISBON INDEX AND GDP PER CAPITA

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Abstract:

The objective of this paper is to analyze the correlation between the index of Lisbon in 2010 and GDP per capita in 43 countries, in order to determine whether exist or not a direct and close correlation between the two indicators. The reason behind the initiation of this review is related to the current dilemma, namely whether the level of GDP reflects or not the degree of welfare of a country or region. If this is true, ie GDP provides an accurate picture of a country's welfare level, there must be direct and strong correlation between two indicators: GDP per capita and Lisbon index. Otherwise, if the GDP is not a representative indicator of the level of welfare, the correlation should be reduced. Further analysis will show the result of that reasoning. Pearson coefficient was calculated, and it was obtained a value of 0.828 which means a strong and direct correlation between the two indicators, in a first phase. After analysis of the two clusters created can be concluded that in developing countries is a direct and strong correlation (Pearson coefficient is 0.703), while in developed countries there is direct correlation but unrepresentative (Pearson coefficient is 0.477).

Keywords: *GDP, Lisbon Index, welfare, correlation*

1. Introduction

The objective of this paper is to analyze the correlation between the index of Lisbon in 2010 and GDP per capita in 43 countries, in order to determine whether exist or not a direct and close correlation between the two indicators. The reason behind the initiation of this review is related to the current dilemma, namely whether the level of GDP reflects or not the degree of welfare of a country or region. If this is true, ie GDP provides an accurate picture of a country's welfare level, there must be direct and strong correlation between two indicators: GDP per capita and Lisbon index. Otherwise, if the GDP is not a representative indicator of the level of welfare, the correlation should be reduced. Further analysis will show the result of that reasoning.

2. Literature review

GDP is the most widely used macroeconomic indicators in all countries and by all international economic organizations. At EU level, the implementation of cohesion policy and structural funds allocation is still based on GDP per capita (Uniunea Europeana, Comitetul Regiunilor, 2010, page 1). Per capita GDP is frequently used to compare quality of life in different countries. Governments often use changes in GDP as an indicator of the success of economic and fiscal policies (Robert Costanza, Maureen Hart, Stephen Posner, and John Talberth, 2009, page 6).

Opponents of the idea that GDP is a relevant indicator of a nation's welfare analysis is based on the fact that this indicator does not take into account the production that is not related to market, such as underground economy, barter, subsistence production, volunteering. Some of these increases welfare of the population, others have a negative impact on it. Also, GDP growth does not necessarily imply an increase in welfare; increased drug consumption increases GDP, but indicates a worsening state of health of the population. GDP does not measure sustainable economic growth, irrational investment lead to GDP growth for the moment, but may have adverse effects on welfare and economic development (Selaru Dan, 2009).

Oskar Morgenstern argues that GDP is the most stupid indicator invented by economists which has no relation to welfare, but the best it can offer is a level of the value of traded goods and services.

Another concern that has been raised about GDP as a measure of progress and welfare is the 'threshold effect.' **As GDP increases, overall quality of life often increases up to a point.** Beyond this point, increases in GDP are offset by the costs associated with increasing income inequality, loss of leisure time, and natural capital depletion. Beyond a certain threshold, further increases in material well-being have the negative side effects of lowering community cohesion, healthy relationships, knowledge, wisdom, a sense of purpose, connection with nature, and other dimensions of human happiness (Robert Costanza, Maureen Hart, Stephen Posner, and John Talberth, 2009, page 9).

To determine whether or not GDP is an indicator representative of a nation's wealth, it must be defined precisely what is meant by wealth. **Welfare of a nation is not only about financial, but also involves social and environmental issues.** The dimensions of welfare are: material living standards (income, consumption and wealth); health; education; the quality of governance; social relationships; environment; personal and economic security. Considering valid the idea, then we can conclude that GDP provides a snapshot of the financial wealth of a nation, but even this picture is not 100% realistic. Related to social and environmental issues, GDP has no power to shape them; so GDP is in the best case a partial indicator of wealth. GDP is a measure of economic quantity, not economic quality or welfare, let alone social or environmental well-being. The same opinion shares the renowned economist, Nobel laureate, J. Stiglitz, „it has long been clear that GDP is an inadequate metric to gauge well-being

over time particularly in its economic, environmental, and social dimensions, some aspects of which are often referred to as sustainability. Measures of wealth are central to measuring sustainability. Some more direct non-monetary indicators may be preferable when the monetary valuation is very uncertain or difficult to derive (Joseph E. STIGLITZ, Amartya SEN, Jean-Paul FITOUSSI, 2008, page 8).”

To complete the picture, other indicators are needed to describe the development and welfare of other angles, especially as social and environmental issues. Identified measures to remedy these deficiencies of GDP in measuring national wealth can be centralized as follows (Yanne Goossens , Arttu Mäkipää , Philipp Schepelmann, Isabel van de Sand, Michael Kuhndtand, Martin Herrndorf , 2007, page 6):

- developing a range of other indicators **to adjust GDP** on welfare issues and to have the same importance in policymaking. In this approach, traditional economic performance measures like GDP or national saving rates have been adjusted by including monetised environmental and social factors. Such indicators can serve as a valuable communication tool whereby the end result sends out a positive or negative signal to the audience. However, difficulties arise when trying to monetise environmental and social factors.
- Developing a range of indicators **to supplement GDP**. The category supplementing GDP seems to be the most realistic and acceptable option for going beyond GDP. Within this approach, GDP is being complemented with additional environmental and/or social information. A first group are the 'satellite account systems' which complement the conventional statistical national accounts with environmental and/or social information. A second group sets social and environmental information in relation to GDP.
- **the replacement of GDP** by a new global index that includes all elements of welfare. This new indicator should become a key indicator of socio-economic policy.

Rising levels of GDP can mask a considerable loss of welfare and well-being. For example, if a country chopped down all its forests, sold the wood and put its children to work instead of sending them to school, it would be very good for its GDP because the economic growth figures would show increasing material prosperity, but this is not welfare. Natural and political disasters can be good for GDP; hurricane Katrina was a boom to Louisiana's GDP because of the enormous efforts and economic activity that had to be invested in reconstruction; the same applies to the GDP of virtually all European economies after the Second World War, but these disasters can hardly be said to have contributed to human or nation welfare (Official Journal of the European Union, 2009).

Based on these deficiencies of GDP, some indicators have been proposed to provide a more accurate picture of social welfare. In this respect the Human Development Index was created and adopted by the United Nations, and also the Global Competitiveness Index too, and many others. There were also proposals to the European Union to build a more realistic index based on the Lisbon objectives. To

meet this proposal, **WEF built the Lisbon Index**, which is composed of eight indicators, **and GDP is not included in the composition of this new index**.

Lisbon index was constructed by the World Economic Forum and give a global dimension to how the country managed to achieve the targets proposed by the Lisbon strategy at the time of 2010, gives a dimension of a country's welfare, development and competitiveness level. The Lisbon process has been a decade-long effort. At the March 2000 European Council in Lisbon, Portugal, Europe's heads of state and government set a 10-year timeline to make the European Union "the most competitive and dynamic knowledge-based economy in the world, capable of sustainable economic growth with more and better jobs and greater social cohesion". The objective of the Lisbon Strategy was to improve Europe's productivity and competitiveness through various goals: the creation of an information society for all; establishing a European area of research and development; developing a business-friendly start-up environment, completing the single market; establishing efficient and integrated financial markets; building a knowledge society; ensuring more and better jobs for Europe; modernizing social protection; promoting social inclusion and enhancing sustainable development (Blanke Jennifer and Stephen Kinnock, 2010, WEF).

In order to built the Lisbon Index, the WEF's specialists broke the Lisbon Strategy into eight distinct dimensions that capture the areas highlighted by Europe's leaders as critical for reaching the goal of becoming the world's most competitive economy. The eight dimensions are (Blanke Jennifer and Stephen Kinnock, 2010, WEF):

1. **Creating an Information Society for All.** This indicator takes into account the folowing variables such as: the prioritization of ICT by the government; ICT penetration rates (Internet, mobile phones); Internet usage by business and the extent to which students have Internet access in schools.
2. **Developing a European Area for Innovation, Research and Development.** This second Lisbon dimension is captured in the index using measures such as: business investment in research and development; the quality of scientific research institutions; the extent of collaboration in research between universities and industry; patenting per capita; and the protection of intellectual property and innovation stimulation through government procurement.
3. **Liberalization: Completing the Single Market/State Aid and Competition Policy.** This indicator takes into account: the intensity of competition in the local market; how numerous are local suppliers; how stringent are standards on product/service quality, safety and other regulations; how prevalent is foreign ownership of companies; the level of government subsidies and tax breaks.
4. **Building Network Industries: In Telecommunications, Utilities and Transportation.** The contruction of this indicator is based on the following variables: mobile telephone subscribers per 100 population; main telephone lines per 100 population; the quality of general infrastructure.
5. **Creating Efficient and Integrated Financial Services.** The variables used in order to define this indicator are: the protection rate of property rights, including

over financial assets; the level of sophistication of financial markets; the soundness of banks; how easy is it to raise money by issuing shares on the stock market.

6. **Improving the Enterprise Environment: Business Start-ups.** The construction of the sixth indicator out of Lisbon Index is based on these variables: how easy or difficult is it to start a new business; how easy is it to obtain a bank loan with only a good business plan and no collateral; how easy is it for entrepreneurs with innovative but risky projects to find venture capital; number of procedures required to start a business; number of days required to start a business; the impact of taxes on incentives to work or invest; number of procedures required to resolve a contract dispute; number of days required to resolve a contract dispute.
7. **Increasing Social Inclusion: Bringing People to the Workforce, Upgrading Skills and Modernizing Social Protection.** Statistical information collected from reports or from the WEF survey, and which help building this indicator are: female participation in the labour force as a percentage of male participation; unemployment rate; how well does the educational system meets the needs of a competitive economy; if the country retain and attract talented people; to what extent do companies invest in training and employee development; how effective are the government's efforts to reduce poverty and address income inequality.
8. **Enhancing Sustainable Development.** Statistical information collected from reports or from the WEF survey, and which help building this indicator are: the quality of the natural environment; the enforcement of environmental regulations; the stringency of country's environmental regulation.

The overall Lisbon scores for each country are calculated as an unweighted average of the individual scores in the eight dimensions. Variables considered in the construction of the eight indicators were collected from official statistical reports, and some were determined based on the results of a survey conducted by WEF, and then all were standardized to be aggregated in index construction. It may be noted that this index covers all three dimensions of welfare: economic, social and environmental, unlike GDP, which reflects only the purely economic side.

Central conclusion of the Conference „Beyond GDP” organized by the European Commission in Brussels in 2007 is that GDP is an important indicator of economic growth, but should not be used as a tool for targeting different policies. GDP provides a snapshot of the financial wealth of a nation, but even this picture is not 100% realistic. Related to social and environmental issues, GDP has no power to shape them; so GDP is in the best case a partial indicator of welfare. To complete the picture, other indicators are needed to describe the development and welfare of other angles, especially as social and environmental issues. Despite criticisms of GDP it will stand still long from now because it is easy to calculate, easy to read, and seemingly objective. Other indicators, although more ambitious, not enjoy these benefits.

3. Research methodology

In our effort to analyze the possible correlation between the index of Lisbon 2010 developed by World Economic Forum (<http://www.weforum.org/pdf/Gcr/LisbonReview/TheLisbonReview2010.pdf>) and the GDP per capita (<http://data.worldbank.org/indicator/NY.GDP.PCAP.CD>) secondary data was used. The collected data for the index of Lisbon 2010 is measured through a score with two decimals on a 7 point scale with 6 intervals and for the GDP per capita is measured in USD with two decimals. The data was centralized and analyzed with PASW Statistics 18.

Due to the different scales upon which the variables (Index of Lisbon 2010 and GDP per capita) are measured, standardization of the two scales was used. Through the process of standardization, data is reduced to the same scale by subtracting the sample mean and dividing by the standard deviation. Thus, the standardized scale will have a mean of 0 and a standard deviation of 1 (Malhotra N., Birks D. 2007).

In the first step of our analysis, all 43 countries were included in the calculation of the Pearson coefficient which value denotes the linear correlation between the two variables. The value of the Pearson coefficient (Table 1) is 0.828 which explains – in this first step – a strong positive correlation between the standardized values of the two considered variables. This correlation is statistic significant at the 0.01 level, which means that such a result is obtained due to 1% by chance.

Table 1. Correlations between the standardized values of the Index of Lisbon 2010 and GDP per capita

		Zscore: Lisbon Index	Zscore: GDP per capita
Zscore: Lisbon Index	Pearson Correlation	1	.828**
	Sig. (2-tailed)		.000
	N	43	43
Zscore: GDP per capita	Pearson Correlation	.828**	1
	Sig. (2-tailed)	.000	
	N	43	43

** . Correlation is significant at the 0.01 level (2-tailed).

After analyzing the bidimensional graphic representation (ordinate – index of Lisbon 2010, abscise – GDP per capita) of the 43 countries we decided to exclude Luxembourg from the data set.

Figure 1. Graphic representation of the 43 countries by the values of the index of Lisbon and of the GDP per capita

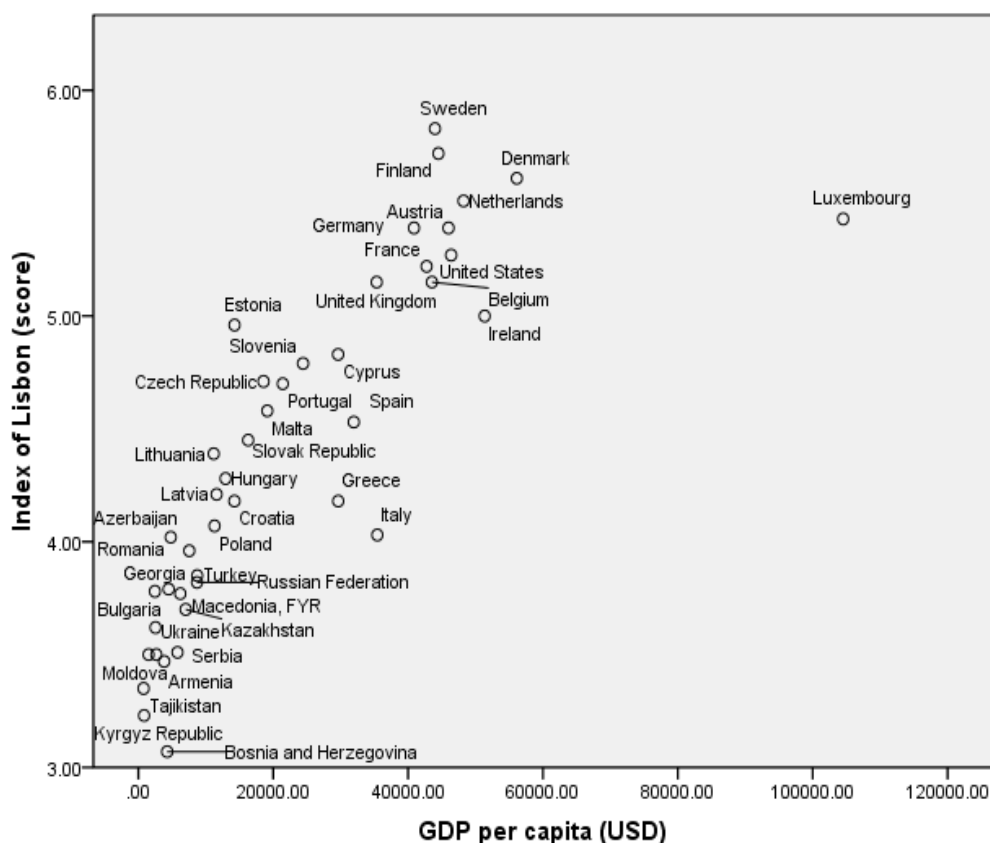


Table 2 denotes again a strong positive correlation between the two considered variables, but with a higher value of the Pearson coefficient (0.898)

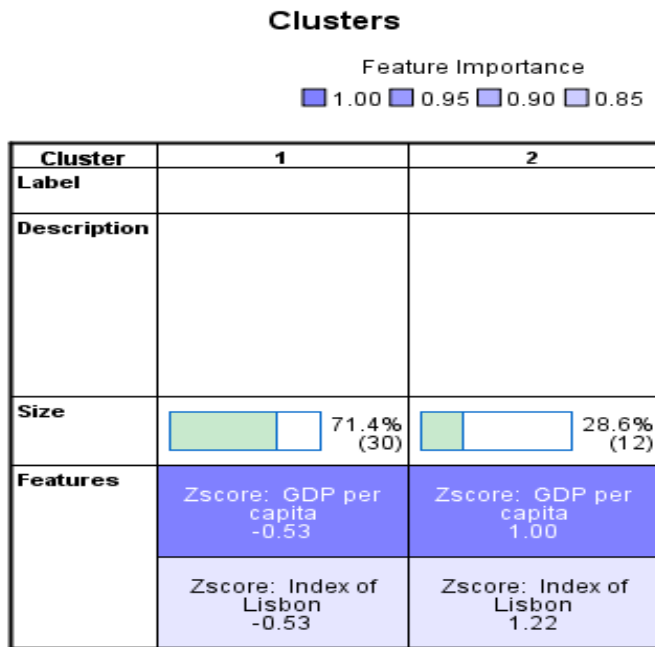
Table 2. Correlations between the standardized values of the Index of Lisbon 2010 and GDP per capita after eliminating Luxembourg from the analysis

		Zscore: Index of Lisbon	Zscore: GDP per capita
Zscore: Index of Lisbon	Pearson Correlation	1	.898**
	Sig. (2-tailed)		.000
	N	42	42
Zscore: GDP per capita	Pearson Correlation	.898**	1
	Sig. (2-tailed)	.000	
	N	42	42

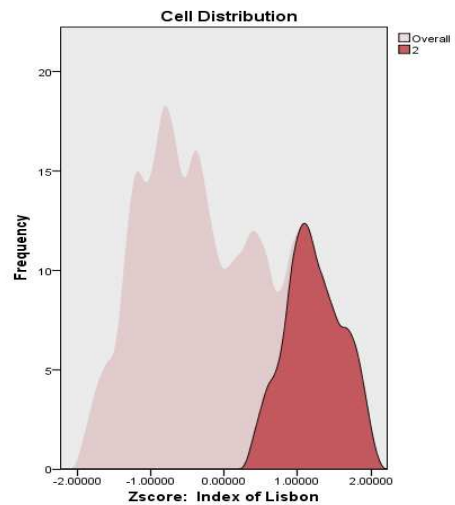
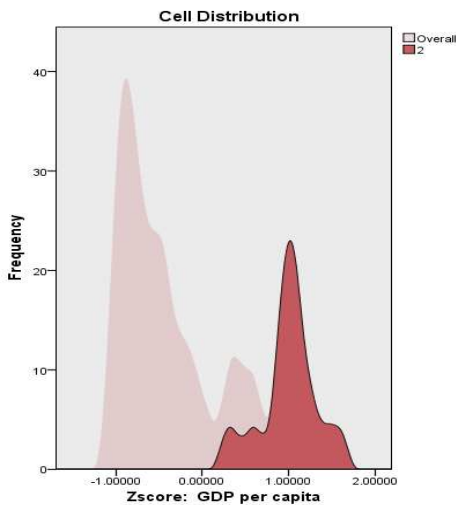
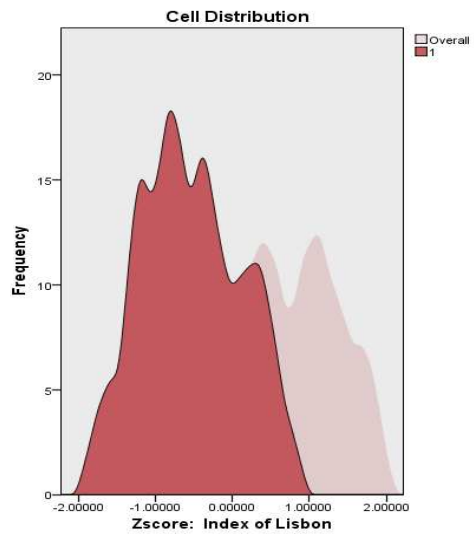
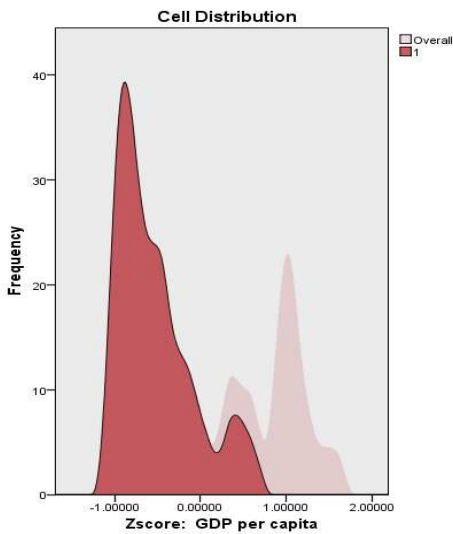
** . Correlation is significant at the 0.01 level (2-tailed).

The second step of our analysis presumes a clustering method (TwoStep Cluster) which groups the analyzed countries (without Luxembourg) by the value frequencies of the two considered variables. The purpose of this step is to split the countries in clusters and to detect the possible correlation between the two variables within the created groups.

Figure 2. Summary of the created clusters



Two clusters were created. Cluster 1 contains 30 countries (Estonia, Slovak Republic, Lithuania, Hungary, Latvia, Croatia, Poland, Slovenia, Czech Republic, Portugal, Malta, Spain, Greece, Italy, Azerbaijan, Romania, Turkey, Russian Federation, Macedonia FYR, Georgia, Bulgaria, Kazakhstan, Ukraine, Serbia, Moldova, Armenia, Albania, Tajikistan, Kyrgyz Republic, Bosnia and Herzegovina), with mean values of the GDP per capita (z score) and Index of Lisbon 2010 distribution of -0.53 as seen in the following CFD (cumulative function distribution). Cluster 2 contains 12 countries (United Kingdom, Sweden, Finland, Denmark, Netherlands, Austria, Germany, United States, France, Belgium, Ireland, Cyprus), with mean value of the GDP per capita distribution (z score) of 1.00 and Index of Lisbon 2010 distribution of 1.22 as seen in the following CFD (cumulative function distribution).



Based on the two created clusters, the Pearson coefficient was calculated (Table 3). The value of 0.703 of the Pearson coefficient within the first cluster denotes a strong positive correlation between the two variables, result which sustains the validity of GDP per capita as a welfare indicator. The value of 0.477 of the Person coefficient explains a positive correlation within the second cluster, result which is not statistical significant, thus GDP per capita cannot be considered an indicator of welfare measure.

Table 3. Correlations between the standardized values of the Index of Lisbon 2010 and GDP per capita within the created clusters

TwoStep Cluster		Zscore: Index of Lisbon	Zscore: GDP per capita
Zscore: Index of Lisbon	Pearson Correlation	1	.703**
	Sig. (2-tailed)		.000
	N	30	30
Zscore: GDP per capita	Pearson Correlation	.703**	1
	Sig. (2-tailed)	.000	
	N	30	30
Zscore: Index of Lisbon	Pearson Correlation	1	.477
	Sig. (2-tailed)		.117
	N	12	12
Zscore: GDP per capita	Pearson Correlation	.477	1
	Sig. (2-tailed)	.117	
	N	12	12

** . Correlation is significant at the 0.01 level (2-tailed).

A possible explanation for the correlation of the two clusters may be due the fact that the first cluster contained mainly developing countries, where welfare dimension is based more on material appearance synthesized by GDP per capita indicator, hence the representative correlation.

The second cluster includes mostly developed countries where welfare is beyond the material dimension, including social and environmental issues, hard to be monetary quantifiable and implicitly not included in GDP, hence the low correlation and its statistically unrepresentative.

Based on these two results, a possible conclusion can be formulated: countries within the second cluster should include in their welfare measure other indicators or indices along with the GDP per capita.

4. Limitation and future research

The conducted research has several **limitations**. Thus, the small number of the analyzed countries is due to inexistence of data regarding the values of the index of Lisbon for other countries. Another limitation exists in the used clustering method – TwoStep Cluster. To confirm the obtained results for the created clusters, other clustering method should be used (Hierarchical Cluster, K-means cluster).

The authors' purpose for future research is to study the possible partial correlation between the eight indicators (components) of the index of Lisbon and the GDP per capita. In this line of thought the authors build up the hypotheses that there may exist a strong positive correlation between the GDP per capita and the indicators

which measure the material wealth and a weak positive or even negative correlation between the GDP per capita and indicators like Innovation and Research and Development, Social Inclusion or Sustainable Development.

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